EMRGENCY EXPRESS TERMS

BY THE
CALIFORNIA DEPARTMENT OF FORESTRY (CDF) & FIRE PROTECTION

OFFICE OF THE STATE FIRE MARSHAL (SFM)

TO THE CALIFORNIA CODE OF REGULATIONS, TITLE 24
CALIFORNIA BUILDING CODE (CBC), PART 2

And

THE CALIFORNIA REFERENCED STANDARDS CODE (CRSC), PART 12

REGARDING PHASE II - WILDLAND-URBAN INTERFACE
FIRE AREAS BUILDING STANDARDS

Legend for Express Terms:

1. The proposed SFM amendments are shown *as Italic font and underlined.*

CHAPTER 1 – ADMINISTRATIVE

SECTION 101-TITLE, PURPOSE AND SCOPE

101.17.14 SFM-Office of the State Fire Marshal.

Public School Automatic Fire Detection, Alarm and Sprinkler Systems

Wildland-Urban Interface Fire Area

Authority Cited – *Health and Safety Code Section 13143, 13108.5 (a) and 18949.2 (b) and (c) and Government Code Section 51189*

Reference – *Health and Safety Code Section 13143 and Government Code Sections 51176, 51177, 51178, 51179, 51182 and Public Resource Code Sections 4201 through 4204 and 4291*

Chapter 7

FIRE-RESISTANT MATERIALS AND CONSTRUCTION

[For SFM] For additional requirements relating to materials and construction methods for exterior wildfire exposure see Chapter 7A.

[For SFM] Chapter 7A

MATERIALS AND CONSTRUCTION METHODS FOR EXTERIOR WILDFIRE EXPOSURE

SECTION 701A SCOPE, PURPOSE AND APPLICATION

***701A.3.2 New Buildings Located in Any Fire Hazard Severity Zone**. New buildings located in any Fire Hazard Severity Zone within State Responsibility Areas, any Local Agency Very-High Fire Hazard Severity Zone, or any Wildland-Urban Interface Fire Area designated by the enforcing agency for which an application for a building permit is submitted on or after January 1, 2008, shall comply with all sections of this chapter.*

***701A.3.2.1 Inspection and certification.** Building permit applications and final completion approvals for buildings within the scope and application of this chapter shall comply with the following:*

***701A.3.2.2** The local building official shall, prior to construction, provide the owner or applicant a certification that the building as proposed to be built complies with all applicable state and local building standards, including those for materials and construction methods for wildfire exposure as described in this Chapter.*

***701A.3.2.3** The local building official shall, upon completion of construction, provide the owner or applicant with a copy of the final inspection report that demonstrates the building was constructed in compliance with all applicable state and local building standards, including those for materials and construction methods for wildfire exposure as described in this Chapter.*

***701A.3.2.4** Prior to building permit final approval the property shall be in compliance with the vegetation clearance requirements prescribed in PRC 4291 & GC 51182.*

Specific statutes being implemented for this adoption and or amendment:

Authority Cited – Health and Safety Code Sections 13143, 13108.5 (a) and 18949.2 (b) and (c) and Government Code Sections 51182 & 51189

Reference – Health and Safety Code Sections 13143 and Government Code Sections 51176, 51177, 51178, 51179, 51182 and Public Resources Code Sections 4201 through 4204 and 4291

SECTION 702A - DEFINITIONS

FIRE HAZARD SEVERITY ZONES

IGNITION-RESISTANT MATERIAL *is any product which, when tested in accordance with UBC Standard 8-1 for a period of 30 minutes, shall have a flame spread of not over 25 and show no evidence of progressive combustion. In addition, the flame front shall not progress more than 10½ feet (3200 mm) beyond the centerline of the burner at any time during the test.*

Materials shall pass the accelerated weathering test and be identified as Exterior type, in accordance with UBC Standard 23-4. All materials shall bear identification showing the fire performance rating thereof. That identification shall be issued by ICC-ES/ICBO-ES or a testing facility recognized by the State Fire Marshal having a service for inspection of materials at the factory.

Fire-Retardant-Treated Wood as defined in section 207 or noncombustible materials as defined in section 215 shall satisfy the intent of this section.

The enforcing agency may use other definitions of ignition-resistant material that reflect wildfire exposure to building materials and/or their materials performance in resisting ignition.

Specific statutes being implemented for this adoption and or amendment:

Authority Cited – Health and Safety Code Sections 13143, 13108.5 (a) and 18949.2 (b) and (c) and Government Code Sections 51182 & 51189

Reference – Health and Safety Code Sections 13143 and Government Code Sections 51176, 51177, 51178, 51179, 51182 and Public Resources Code Sections 4201 through 4204 and 4291

SECTION 703A – STANDARDS OF QUALITY

703A.1 General*. Material, systems, and methods of construction used shall be in accordance with this Chapter.*

703A.2 Qualification by Testing*. Material and material assemblies tested in accordance with the requirements of section 703A shall be accepted for use when the results and conditions of those tests are met. Testing shall be performed by a testing agency approved by the State Fire Marshal or identified by an ICC-ES/ICBO-ES report.*

703A.3 Standards of Quality*. The State Fire Marshal standards listed below and as referenced in this Chapter are located in the California Referenced Standards Code, Part 12 and Chapter 35 of this code.*

SFM 12-7A-1*, Exterior Wall Siding and Sheathing*

SFM 12-7A-2*, Exterior Window*

SFM 12-7A-3, *Under Eave*

SFM 12-7A-4, *Decking*

Specific statutes being implemented for this adoption and or amendment:

Authority Cited – Health and Safety Code Sections 13143, 13108.5 (a) and 18949.2 (b) and (c) and Government Code Sections 51182 & 51189

Reference – Health and Safety Code Sections 13143 and Government Code Sections 51176, 51177, 51178, 51179, 51182 and Public Resources Code Sections 4201 through 4204 and 4291

SECTION - 704A - MATERIALS, SYSTEMS AND METHODS OF CONSTRUCTION

SECTION 704A.1- ROOFS

704A.2 Attic Ventilation.

704A.2.3 Eave Protection*. Eaves and soffits shall meet the requirements of SFM 12-7A-3 or shall be protected by ignition-resistant materials or noncombustible construction on the exposed underside.*

704A.3 - EXTERIOR WALLS

704A.3.1 General*. Exterior walls shall be approved non-combustible or ignition-resistant material, heavy timber, or log wall construction or shall provide protection from the intrusion of flames and embers in accordance with standard SFM 12-7A-1.*

704A3.1.1 Exterior wall coverings*. Exterior wall coverings shall extend from the top of the foundation to the roof, and terminate at 2 inch (50.8 mm) nominal solid wood blocking between rafters at all roof overhangs, or in the case of enclosed eaves, terminate at the enclosure.*

704A.3.2 Exterior Wall Openings*. Exterior wall openings shall be in accordance with this section.*

704A.3.2.1 Exterior Wall Vents*. Unless otherwise prohibited by other provisions of this code, vent openings in exterior walls shall resist the intrusion of flame and embers into the structure or vents shall be screened with a corrosion-resistant, non-combustible wire mesh with ¼ inch (6 mm) openings or its equivalent.*

704A.3.2.2 Exterior Glazing and window walls*. Exterior windows, window walls, glazed doors, and glazed openings within exterior doors shall be insulating-glass units with a minimum of one tempered pane, or glass block units, or have a fire resistance rating of not less than 20 minutes, when tested according to ASTM E 2010, or conform to the performance requirements of SFM 12-7A-2.*

704A.3.2.3 Exterior door assemblies. *Exterior door assemblies shall conform to the performance requirements of standard SFM 12-7A-1or shall be of approved non-combustible construction, or solid core wood having stiles and rails not less than 1-3/8 inches thick with interior field panel thickness no less than 1 1/4" thick, or shall have a fire resistance rating of not less than 20 minutes when tested according to ASTM E 2074.*

> ***Exception:*** *Noncombustible or exterior fire retardant treated wood vehicle access doors are not required to comply with this chapter.*

Specific statutes being implemented for this adoption and or amendment:

Authority Cited – Health and Safety Code Sections 13143, 13108.5 (a) and 18949.2 (b) and (c) and Government Code Sections 51182 & 51189

Reference – Health and Safety Code Sections 13143 and Government Code Sections 51176, 51177, 51178, 51179, 51182 and Public Resources Code Sections 4201 through 4204 and 4291

704A.4 DECKING, FLOORS AND UNDERFLOOR PROTECTION

704A.4.1 Decking.

704A.4.1.1 Decking Surfaces. *Decking, surfaces, stair treads, risers, and landings of decks, porches, & balconies where any portion of such surface is within 10 feet (3048 mm) of the primary structure shall comply with one of the following methods. The use of paints, coatings, stains, or other surface treatments are not an approved method of protection as required in this Chapter:*

1. Shall be constructed of Ignition Resistant Materials and pass the performance requirements of SFM 12-7A-4, Parts A and B.

2. Shall be constructed with heavy timber, exterior fire retardant treated wood or approved non-combustible materials.

3. Shall pass the performance requirements of SFM 12-7A-4, Part A,12-7A-5.7.5, 1 only with a net peak heat release rate of 25kW/sq-ft for a 40 minute observation period and:

a. *Decking surface material shall pass the accelerated weathering test and be identified as Exterior type, in accordance with UBC Standard 23-4 and;*
b. *The exterior wall covering to which ~~it~~ the deck is attached and within 10 (3048 mm) feet of the deck shall be constructed of approved non-combustible or ignition resistant material.*

Exception: *Walls are not required to comply with this sub-section if the decking surface material conforms to ASTM E-84 Class B flame spread.*

704A.4.2 Underfloor and Appendages Protection

704A4.2.1 Underside of Appendages and Floor Projections. *The underside of cantilevered and overhanging appendages and floor projections shall maintain the ignition-resistant integrity of exterior walls, or the projection shall be enclosed to the grade.*

704A.4.2. Unenclosed Underfloor Protection*. Buildings shall have all underfloor areas enclosed to the grade with exterior walls in accordance with section 704A.3.*

> ***Exception:*** *The complete enclosure of under floor areas may be omitted where the underside of all exposed floors, exposed structural columns, beams and supporting walls are protected as required with exterior ignition-resistant material construction or be heavy timber.*

Specific statutes being implemented for this adoption and or amendment:

Authority Cited – Health and Safety Code Sections 13143, 13108.5 (a) and 18949.2 (b) and (c) and Government Code Sections 51182 & 51189

Reference – Health and Safety Code Sections 13143 and Government Code Sections 51176, 51177, 51178, 51179, 51182 and Public Resources Code Sections 4201 through 4204 and 4291

705A. ANCILLARY BUILDINGS AND STRUCTURES

705A.1 Ancillary Buildings and Structures. *When required by the enforcing agency ancillary buildings and structures and detached accessory structures shall comply with the provisions of this Chapter.*

Specific statutes being implemented for this adoption and or amendment:

Authority Cited – Health and Safety Code Sections 13143, 13108.5 (a) and 18949.2 (b) and (c) and Government Code Sections 51182 & 51189

Reference – Health and Safety Code Sections 13143 and Government Code Sections 51176, 51177, 51178, 51179, 51182 and Public Resources Code Sections 4201 through 4204 and 4291

Chapter 35
UNIFORM BUILDING CODE STANDARDS

SECTION 3504-RECOGNIZED STANDARDS

Part II – UBC Standards

UBC Std. And Sec.	TITLE AND SOURCE

[For SFM] CHAPTER 7A

7A-1 704A.2.1 ASTM E 2010 Fire resistive rating for exterior glazing

7A-2 704.A.2.2 ASTM E 2074 Fire resistive rating for exterior door assemblies

7A-3 704A.4.1.1 UBC 23-4 Fire retardant treated wood tests on the durability and hydroscopic properties. This standard is located in the 1997 Uniform Material Testing and Installation Standards, Volume three of the Uniform Building Code.

7A-4 704.A.4.1.3 ASTM E-84 Class B flame Spread test

3504.1.2 [For SFM] *California State Fire Marshal (SFM) Standards*

SFM 12-7A-1, Exterior Wall Siding and Sheathing

SFM 12-7A-2, Exterior Window

SFM 12-7A-3, Under Eave

SFM 12-7A-4, Decking

(The California State Fire Marshal standards referred to above are found in the California Code of Regulations, Title 24, Part 12.)

CALIFORNIA REFERENCED STANDARDS CODE (CRSC), PART 12

Chapter 12-7A

MATERIALS AND CONSTRUCTION METHODS FOR EXTERIOR WILDFIRE EXPOSURE

Exterior Wall Siding and Sheathing

SFM Standard 12-7A-1

12-7A-1.1 Application. *The minimum design, construction and performance standards set forth herein for exterior wall siding and sheathing are those deemed necessary to establish conformance to the provisions of these regulations. Materials and assemblies that meet the performance criteria of this standard are acceptable for use in Very High Fire Hazard Zones as defined in California Building Code, Chapter 7A.*

12-7A-1.2 Scope. *This standard determines the performance of exterior walls of structures when exposed to direct flames.*

12-7A-1.3 Referenced documents.

1. ASTM D4444. Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters

2. ASTM D 2898. Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing

3. California Building Code, Chapter 7A and 35

12-7A-1.4 Definitions

*1.**Cladding**. Any material that covers an interior or exterior wall*

*2. **Sheathing**. The outside covering used over the wall framework and is nailed directly to the wall framing members.*

12-7A-1.5 Equipment

*1. **Burner.** A 4 x 39 in. (100 x 1000 mm) propane diffusion burner shall be used.*

*2. **Infrared temperature analyzer** (optional). Intended for monitoring the temperature change of the inside of the sheathing material.*

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*3. **Moisture meter**. For measurement of moisture content of framing*

12-7A-1.6 Materials

*1 **Cladding**. Material selected for the test*

*2 **Sheathing** (optional). 4- x 8-ft (1.2- x 2.4- m) sheet*

*3. **Framing**. 2 x 4 studs*

12-7A-1.7 Test system preparation See Figure No. 1

*1.**Wall Module.** The module shall be designed to permit rapid installation and removal of wall assemblies and have two adjustable non-combustible sidewalls, and a non-combustible simulated soffit. The module shall permit insertion of a prefabricated 4 x 8 ft (1.2 x 2.4 m) wall section.*

*2 **Framing**. Frame the wall assembly with 2 x 4 studs, typically 16 in. (410 mm) on center.*

*3.**Moisture content**. Measure the moisture content of the wooden members of the assembly using a moisture meter (ASTM D4444)*

*4.**Sheathing**. Add sheathing material (optional). If sheathing is used, tests must be run on nominal 0.5-in (12 mm) oriented standboard of Exposure 1 rating. Any other sheathing may be run, but must be reported. The sheathing must have one seam on a selected stud with a 0.125-in. (3 mm) gap.*

*5.**Cladding**. Attach the chosen cladding according to the cladding manufacturer's directions. All potential cladding joints that may be present in a typical wall must be incorporated into the assembly.*

*6.**Other materials**. Other components of the wall assembly, such as building felt and sheathing, are chosen to meet the manufacturer's specifications and/or local building codes. Cavity insulation is not to be used.*

*7.**Sealing**. Seal the top and side edges of the installed wall with ceramic wool or comparable material to prevent flame penetration at the edges.*

*8.**Finish**. The wall should be finished in a manner appropriate for exterior exposure as specified by the manufacturer.*

12-7A-1.8 Pretest Weathering (Optional).

*1. **Number of test assemblies.** Prepare six assemblies of which three shall be randomly selected for the weathering exposure. The remaining three assemblies shall be tested as unweathered controls.*

2. ***Preparation.*** *The back of the wall assembly must be protected from water penetration by stapling or taping a 4 x 8 ft (1.2 x 2.4 m) sheet of polyethylene film to the outside of the framing members (the side opposite the cladding) to protect the interior of the wall cavity from being wetted by overspray.*

3. ***Weathering.*** *Subject the assembly to the 12-week wetting-drying weathering exposure defined in ASTM D 2898, Method A, with the following modifications:*

   (a). The assembly shall be mounted vertically.

   (b). The heating cycle shall consist of air heated at 125 ± 5°F (50 ± 2°C) impinging on the wall at 10 mph (17 km/h or 4.5 m/s).

   (c). An ultraviolet exposure shall be used during the weathering exposure, with the lamps activated during the 72-h drying cycles. Installation and exposure details regarding the sunlamps shall be as described in ASTM D 2898, but shall be modified for a sample having a vertical orientation.

   (d). The polyethylene film shall be removed after weathering is completed.

4. ***Conditioning.*** *Prior to testing, the weathered wall assemblies shall be stored for at least 2 wk indoors with good air circulation at temperatures between 60 and 90°F (16 to 32°C) to allow excess moisture to evaporate.*

12-7A-1.9 Conduct of Tests.

1. ***Airflow.*** *The wall test shall be conducted under conditions of ambient airflow.*

2. ***Number of tests****. Conduct the tests on three replicate wall assemblies (six for weathered performance).*

3. ***Burner output verification.*** *Without the wall assembly in place, adjust the burner for 150 ± 8 kW output. Extinguish the burner.*

4. ***Burner configuration****. Center the burner relative to the width of the cladding-wall assembly and 0.75 in. (20 mm) from the wall. The distance from the floor to the top of the burner shall be 12 in. (300 mm).*

A. Procedure

1. *Ignite the burner, controlling for constant 150 ± 8 kW output.*

2. *Continue the exposure until flame penetration of the cladding-wall assembly occurs, or for a 10-min period.*

3. *If penetration does not occur, continue the test for an additional 60 min or until all combustion has ceased. An infrared thermometer has been found to be*

useful to detect the increase of temperature on the back side of the sheathing and an aid to identify the areas of potential combustion.

5. ***Observations.*** *Note the time, location, and nature of flame penetration*

12-7A-1.10 Report. *The report shall include a description of the wall cladding, sheathing material and details of the construction of the subassembly, details of the cladding installation, moisture content of the framing, whether the weathering test was conducted, and where flame penetration of the wall occurred. Provide details on the time and reasons for early termination of the test.*

12-7A-1.11 Conditions of Acceptance. *Should one of the three replicates fail to meet the Conditions of Acceptance, three additional tests may be run. All of the additional tests must meet the Conditions of Acceptance.*

1. Absence of flame penetration through the wall assembly at any time.

2. Absence of evidence of glowing combustion on the interior surface of the assembly at the end of the 70-min test.

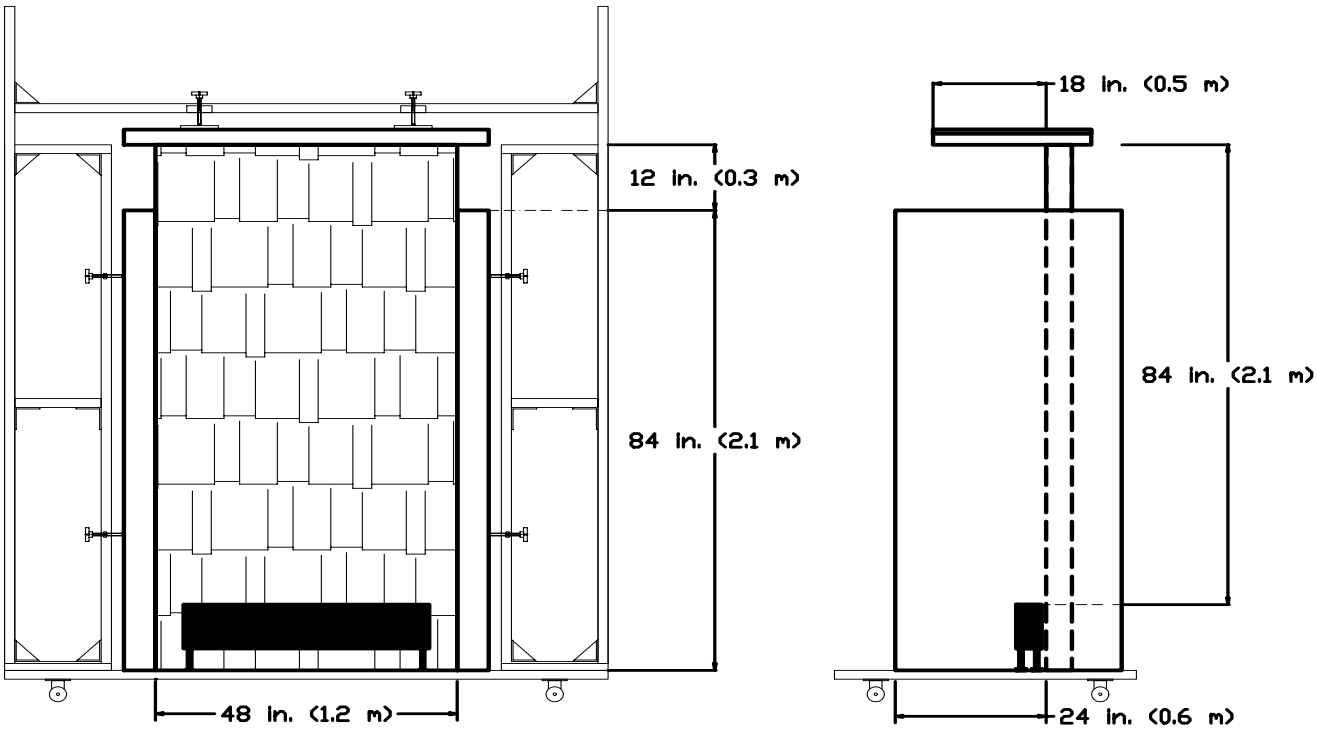

Figure 1. Exterior Wall Test Assembly

Chapter 12-7A

MATERIALS AND CONSTRUCTION METHODS FOR EXTERIOR WILDFIRE EXPOSURE

Exterior Windows

SFM Standard 12-7A-2

12-7A-2.1 Application. *The minimum design, construction and performance standards set forth herein for exterior windows are those deemed necessary to establish conformance to the provisions of these regulations.*

12-7A-2.2 Scope. *This standard evaluates the performance of exterior windows used in structures when exposed to direct flames.*

12-7A-2.3 Tested and Listed Materials. *Materials and assemblies which have been tested and listed by an approved testing agency for the intended purpose need not be individually re-tested. Such individually tested and listed materials and assemblies shall be subjected to the performance standard tests to determine their suitability for use in the exterior window assembly.*

12-7A-2.4 Alternate Constructions. *This standard does not expressly require the use of specific materials or forms of construction. Combinations of materials and assemblies may be investigated and tested in accordance with these regulations, and if found to be substantially equivalent in performance may be given recognition for approval.*

12-7A-2.5 Referenced Documents.

a. *AAMA (for definitions) Training Manual, Residential & Light Commercial Window and Door Installation Training and Registration Program.*
b. *CAWM 400-95 Standard practice for installation of windows with integral mounting flange in wood frame construction*

12-7A-2.6 Definitions.

c. ***Glazing****. The glass in a window. It may include layers of plastic as well as glass.*
d. ***Sash****. The fixed or movable parts of the window in which the panes of glass are set.*
e. ***Frame (Jambs)****. This usually consists of two vertical members (side jambs) and two horizontal members (head and sill) that hold the sash. Frames and sash are typically made of steel, aluminum, vinyl, fiberglass, wood, or a combination of these materials.*

12-7A-2.7 Test Apparatus.

f. ***Wall Assembly Test Module****. The module is designed to permit rapid installation and removal of window/wall assemblies, and is designed to prevent edge penetration of fire at the margins. It includes two non-combustible side walls attached to a wall frame assembly, and a simulated soffit that is also non-combustible. The assembly permits a pre-fabricated 4 x 8 ft. (1.2 x 2.4 m.) wall section containing the test window, to be inserted from the rear and sealed in such a way that the edges are protected from fire (see Figure 1).*

g. ***Burner****. A 4 x 39 in. (100 x 1000 mm.) propane diffusion burner shall be used.*

h. ***Burner location****. The burner shall be positioned so that it is centered relative to the width of the wall assembly and against the wall. The distance from the floor to the top of the burner shall be 12 in. (300 mm.).*

12-7A-2.8 Test Assembly.

1. ***Window****. The window may be any type or size that fits within the wall. The burner's flame should cover the full width of the window, and at least half the window height. Note: Larger windows may be tested by expanding the size of the rear wall of the Wall Assembly Test Module.*
2. ***Wall assembly****. A non-combustible wall shall be used with a manufacturer or code-specified opening for the particular window.*
3. ***Materials****. In the absence of the window manufacturer's specifications, the wall assembly shall include the following minimum components:*
    - ii. *2 x 4 in. studs spaced 16 in. (410 mm.) on center, framed out to incorporate a rough opening sized to receive the test window such that the window is centered relative to the width of the wall;*
    - iii. *gypsum board for mounting around the window once it is installed;*
    - iv. *pieces of gypsum cut into narrow strips for use as trim around the window;*
    - v. *caulk to be used as per the window manufacturer's instructions.*

1. *Install window in framed rough opening following manufacturer guidelines. Apply manufacturer recommended caulk to nailing flange prior to installation. Use narrow strips of gypsum board as trim around window, covering the nail flange of the window. Any type of framing material may be tested. Apply finish to window frame if recommended by window manufacturer. Note: A finish coat is usually required only for wood-framed windows.*

    a. *Fit the window into the rear wall of the Wall Assembly Test Module, sealing all edges, including the soffit-to-wall joint. Ceramic wool or comparable material shall be used for sealing.*

12-7A-2.9 Conduct of Tests.

1. ***Burner Output Verification****. Without the window in place, set the burner for 150 kW output. Conduct a verification run of 3 min. to assure the heat release rate, and then turn off the burner.*

2. ***Test.*** *Place the burner against the wall assembly at the center. Ignite the burner at the 150 kW output for 3 min. and control during the test for constant and uniform output. Optional radiometers can be placed behind the Wall Assembly Test Module to measure heat flux through the window glass.*

3. ***Duration and Observations****. The test shall be continued until flame-through occurs at the window. Flame-through can occur at the glass (glazing) and/or in the frame. At this point, the burner shall be extinguished and the assembly monitored for sustained combustion. Note the time elapsed and location of penetration if it occurs.*

4. ***Report.*** *Report a description of the window unit, including the types of frames, cladding and panes being tested and details of the installation. Record when and how the glass breaks or flame-through occurs in the framing materials or sash, and/or if the framing material deforms or otherwise suffers a loss of integrity such that the glass cannot be held in place, and a record of the time at which any of these events occur.*

12-7A-2.10 Conditions of Acceptance.

1. ***Duration of direct flame exposure****. To pass this test standard, the window and window assembly shall withstand 8 minutes of direct flame exposure with the absence of flame penetration through the window frame or pane, or structural failure of the window frame or pane.*

2. *Flame penetration or structural failure of the frame or pane anytime during the test constitutes failure of this test standard.*

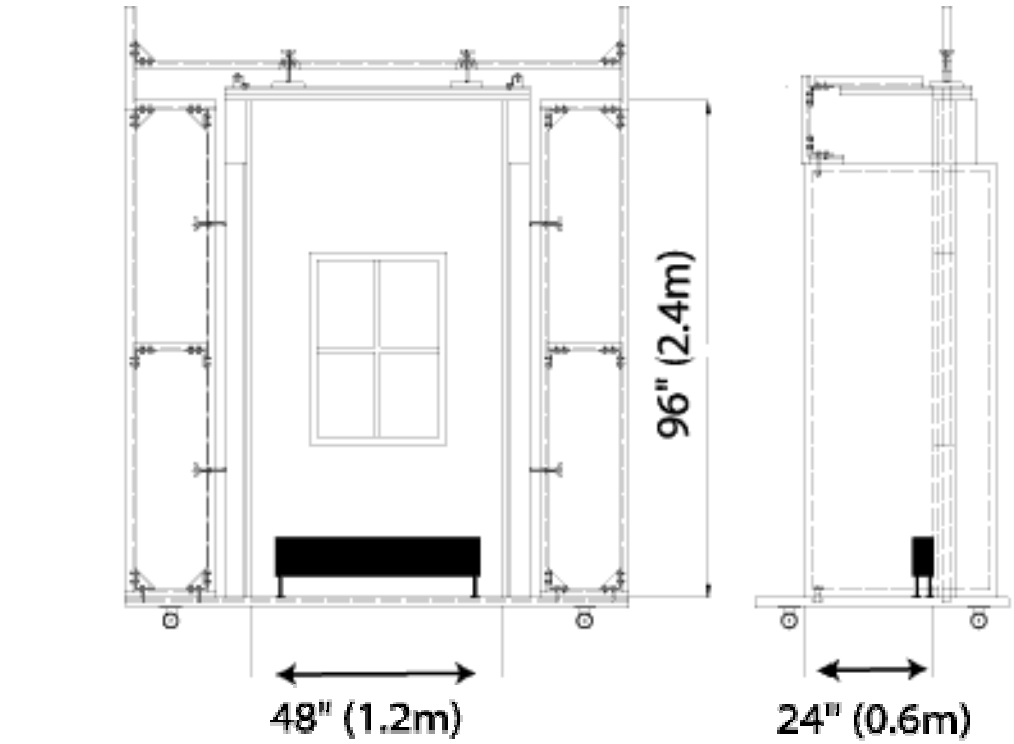

Figure 1. Schematic of the Wall Assembly
Test Module used for evaluating the fire performance of a window.

Chapter 12-7A

MATERIALS AND CONSTRUCTION METHODS FOR EXTERIOR WILDFIRE EXPOSURE

Under Eave

SFM Standard 12-7A-3

12-7A-3.1 Application. *The minimum design, construction and performance standards set forth herein for exterior wall eaves are those deemed necessary to establish conformance to the provisions of these regulations. Materials and assemblies that meet the performance criteria of this standard are acceptable for use in Very High Fire Hazard Zones as defined in California Building Code, Chapter 7A.*

12-7A-3.2 Scope. *This standard determines the performance of eaves of exterior walls of structures when exposed to direct flames.*

12-7A-3.3 Referenced documents.

1. ASTM D4444. Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters

2. California Building Code, Chapter 7A.

12-7A-3.4 Definitions

*1**. Eaves.** A projecting edge of a roof that extends beyond the supporting wall.*

*2**. Soffit.** The enclosed underside of any exterior overhanging section of a roof eave.*

12-7A-3.5 Equipment

*1**. Burner.** A 4 x 39 in. (100 x 1000 mm) propane diffusion burner shall be used.*

*2**. Infrared temperature analyzer** (optional). Intended for monitoring the temperature change of the inside of the eaves.*

*3**. Moisture meter.** For measurement of moisture content of framing (see ASTM D4444).*

12-7A-3.6 Materials

*1. **Framing.** The materials used shall be representative of the grades that would be typical of eave construction and installed in the eaves subassembly as per accepted construction practices.*

*2. **Soffit**. Material selected for the test.*

12-7A-3.7 Test system preparation (Figure 1)

*1. **Eaves fabrication**. The assembly shall be constructed to fit into a 4-ft- (1.2-m-) wide space in the wall module. Normal roof framing, joints in soffit material, and other typical features present in the constructed assembly shall be present in the test specimen.*

*2. **Wall Module.** The module shall be designed to permit rapid installation and removal of eave assemblies and have two adjustable non-combustible sidewalls.*

*3. **Eaves assembly**. Fit the eave assembly into the wall module so that the lowest point of the assembly is 82 in. (2.1 m) from the top of the burner.*

*4. **Moisture content**. Measure the moisture content of the wooden members of the assembly using a moisture meter (D4444).*

*5. **Sealing**. Seal the edges and ends with ceramic wool or comparable material to prevent flame penetration in these locations of the eave assembly.*

*6. **Finish**. The eaves shall be finished in a manner appropriate for exterior exposure as per accepted construction practices.*

12-7A-3.8 Conduct of Tests.

*1. **Airflow.** The wall test shall be conducted under conditions of ambient airflow.*

*2. **Number of tests**. Conduct the tests on three replicate eaves assemblies.*

*3. **Burner output verification.** Without the eaves assembly in place, adjust the burner for 300 ± 15 kW output. Extinguish the burner.*

*4. **Burner configuration**. Center the burner with respect to the width of the eaves-wall assembly and 0.75 in. (20 mm) from the wall. The distance from the floor to the top of the burner shall be 12 in. (300 mm).*

5. ***Procedure***

(a) Ignite the burner, controlling for a constant 300 ± 15 kW output.

(b) Continue the exposure until flame penetration of the eaves occurs or for a 10-min period.

(c) If penetration does not occur, continue observation for an additional 30 min or until all combustion has ceased. An infrared thermometer has been found to be useful to detect the increase of temperature on the back side of the eaves and as an aid to identify the areas of potential combustion.

6. ***Observations.*** *Note the time, location, and nature of flame penetration.*

12-7A-3.9 Report. *The report shall include a description of the eaves material, details of the construction of the eaves, moisture content of the framing, and point of flame penetration. Provide details on the time and reasons for early termination of the test.*

12-7A-3.10 Conditions of Acceptance. *Should one of the three replicates fail to meet the Conditions of Acceptance, three additional tests may be run. All of the additional tests must meet the Conditions of Acceptance.*

1. Absence of flame penetration of the eaves at any time.

2. Absence of structural failure of the eaves subassembly at any time.

3. Absence of sustained combustion of any kind at the conclusion of the 40-min test.

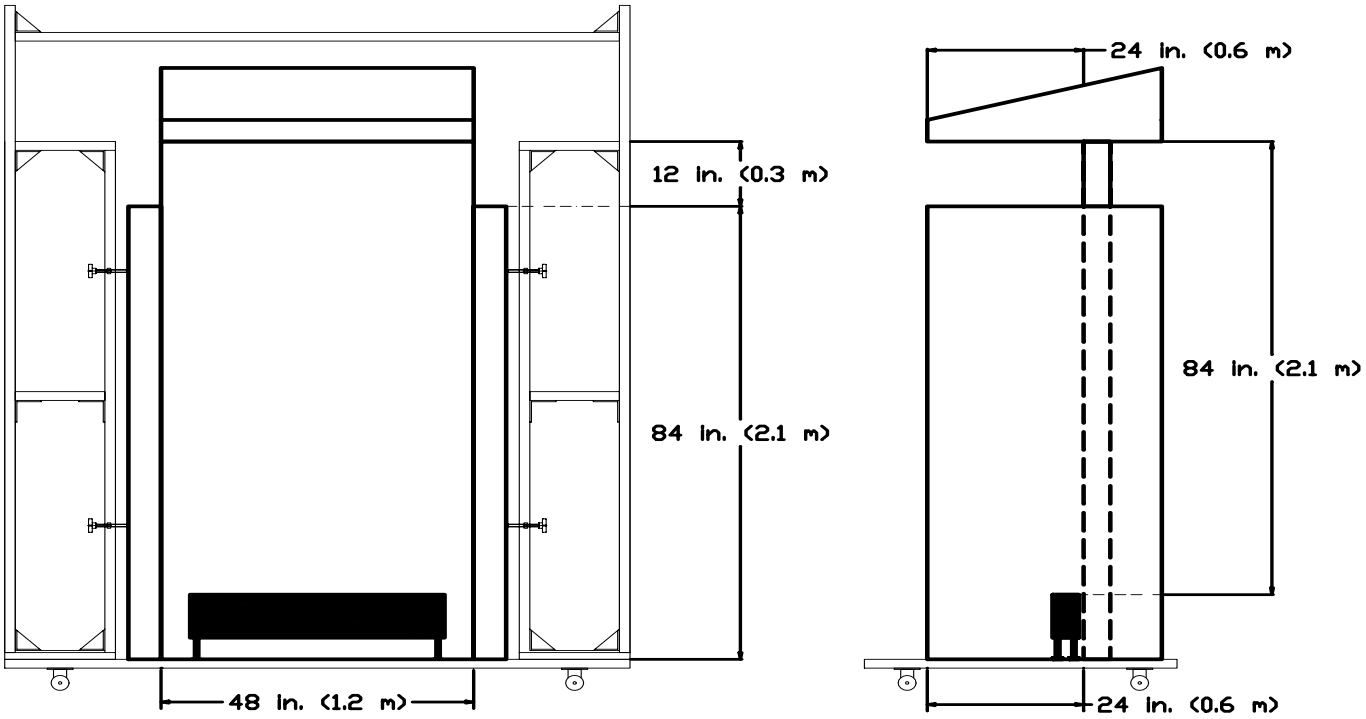

Figure 1. Eaves-Wall Test Assembly

Chapter 12-7A

MATERIALS AND CONSTRUCTION METHODS FOR EXTERIOR WILDFIRE EXPOSURE

Decking

SFM Standard 12-7A- 4

12-7A-5.1 Application*. The minimum design, construction and performance standards set forth herein for unloaded decks are those deemed necessary to establish conformance to the provisions of these regulations. Materials and assemblies that meet the performance criteria of this standard are acceptable for use in Very High Fire Hazard Zones as defined in California Building Code, Chapter 7A.*

12-7A-5.2 Scope. *This standard determines the performance of decks (or other horizontal ancillary structures in close proximity to primary structures) when exposed to direct flames and brands. The under-deck flame exposure test is intended to determine the heat release rate (HRR) and degradation modes of deck or other horizontal boards when exposed to a burner flame simulating combustibles beneath a deck. The burning brand exposure test is intended to determine the degradation modes of deck or other horizontal boards when exposed to a burning brand on the upper surface.*

12-7A-5.3 Referenced document.

ASTM D4933. Guide for moisture conditioning of wood and wood-based materials

ASTM E108. Standard Test Methods for Fire Tests of Roof Coverings

California Building Code, Chapter 7A

12-7A-5.4 Definitions.

1. ***Deck boards.*** *Horizontal members that constitute the exposed surface of the ancillary structure.*

2. ***Heat release rate.*** *The net rate of energy release as measured by oxygen depletion calorimetry*

12-7A-5.5 Test Assembly.

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*1. **Size**. The overall size of the test deck shall be 2 x 2 ft (610 x 610 mm) unless width variation of deck boards requires an increase in overall deck width (i.e., the direction of joists) in order to meet the overall dimensions. The length of individual deck boards shall be 2 ft (610 mm).*

*2. **Joists**. The deck is supported by two sets of 2 x 6 Douglas-fir joists, 28 in. (710 mm) long, and constructed with a 16-in. (406 mm) center-to-center spacing. The joists shall be conditioned to 6% equilibrium moisture content as per ASTM D4933. A comparable species that may be more commonly used for structural framing of decks in a given region can be substituted for Douglas-fir.*

*3. **Deck board spacing and fastening**. Edge-to-edge spacing is 3/16 in. (5 mm), with boards attached to the joists with 2-in. (50 mm) deck screws inserted into deck boards spaced 1.5 in. (38 mm) from the front and back edges of the deck boards. The front deck board shall be flush with the ends of the joists, and the rear deck board shall overhang the end of the joists by 1 in. (25 mm).*

(a) Boards manufactured for tongue and groove edge connections are to be spaced as per the manufacturer's recommendation.

(b) Alternate fastening schedules can be used if specified by the deck board manufacturer

(c) If 2 x 6 deck boards are used, a total of 5 boards shall be used for each deck. Changing the board width could change the number of deck boards.

12-7A-5.6 Materials.

1. All deck board materials are to have cross-sectional dimensions equivalent to use in service.

2. Material tested must be representative of commercially available products

3. If solid wood deck boards are used, the species or lumber group shall be identified.

4. If the material is "plastic lumber" or other composites, the type and amounts of the plastic(s) and the wood-plastic ratio shall be determined.

5. All materials are to be conditioned to equilibrium to 6% EMC conditions prior to testing as specified in ASTM D4933.

12-7A-5.7 PART A. Under-flame test

12-7A-5.7.1 Equipment

*1. **Burner**. A 12 x 12 in. (300 x 300 mm) sand burner shall be used to provide an output of 80 ± 4 kW using a regulated propane gas source. Burner output can be determined from HRR or calculated from propane flow rate, temperature, and pressure.*

*2. **Oxygen depletion calorimeter.** The system includes a hood, associated ducting, and instrumentation to provide HRR data by oxygen depletion calorimetry.*

12-7A-5.7.2 Test system preparation. See Figure No. 1

*1. **Deck support assembly.** Assembly that holds the test deck over the burner.*

*2. **Baffle panels and joist support.** Horizontal metal plates to support the deck joists along their full length, and also to confine burner flames to the underside of the deck boards located between the support joists.*

*3. **Back wall.** Ceramic fiber board or another noncombustible panel product for the back wall material. Total height of the back wall is 8 ft (2.4 m).*

*4. **Ledger board.** A 4-ft (1.2-m) long simulated 2 x 6 ledger board shall be constructed of layers of ceramic fiber board (or other noncombustible panel product) and attached to the wall at a height slightly below the overhang of the rear deck board of the test deck*

12-7A-5.7.3 Conduct of Tests.

*1. **Airflow**. The test is conducted under conditions of ambient airflow.*

*2. **Number of tests**. Conduct the test on three replicate assemblies*

*3. **Burner output verification.** Without a deck in the apparatus, set the output of the burner to 80 ± 4 kW. Conduct a verification run of 3 min to assure the heat release rate, and then turn off the burner.*

*4. **Measurement of heat release rate.** HRR is measured during the tests with a properly calibrated oxygen depletion calorimeter. Since HRR is typically a post-test analysis, this criterion for Acceptance may be determined at the end of the test.*

5. ***Burner configuration***. *Center the burner directly under the middle deck board, midway between the joists. The distance from the top of the burner to the bottom of the deck boards shall be 27 in. (690 mm)*

6. ***Procedure***.

1. Ignite the burner, controlling for a constant 80 ± 4 kW output.

2. Continue the exposure for a 3 min period, Extinguish the burner.

3. Continue observation for an additional 40 min or until all combustion has ceased. The test shall be terminated immediately if flaming combustion accelerates uncontrollably (runaway combustion) or structural failure of any deck board occurs.

7. ***Observations***. *Note physical changes of the deck boards during the test, including structural failure of any deck board, location of flaming and glowing ignition, and loss of material (i.e., flaming drops of particles falling from the deck). It is desirable to capture the entire test with a video recorder to allow review the details of performance.*

12-7A-5.7.4 Report. *The report shall include a description of the deck board material and the time of any degradation (peak heat release rate, structural failure, flaming drops or particles falling from the deck) during the test.*

12-7A-5.7.5 Conditions of Acceptance. *Should one of the three replicates fail to meet the Conditions of Acceptance, three additional tests may be run. All of the additional tests must meet the Conditions of Acceptance.*

1. Peak heat release rate of less than or equal to 25 kW/ft^2 (2.3 kW/m^2)

2. Absence of sustained flaming or glowing combustion of any kind at the conclusion of the 40-min observation period.

3. Absence of structural failure of any deck board.

4. Absence of falling particles that are still burning when reaching the burner or floor.

12-7A-5.8 PART B. Burning brand exposure

12-7A-5.8.1 Equipment

1. ***Wind tunnel***. *The wind tunnel shall have the capability of providing 12 mph (5.4 m/s) airflow over the deck assembly*

*2. **Anemometer**. Device for measuring airflow across the deck.*

*3. **Burner**. Gas-fueled burner for brand ignition.*

***12-7A-5.8.2 Test system preparation.** See Figure No. 2. The ASTM E108 "A" brand roof test apparatus is to be used, with the following modifications:*

*1. **Deck support**. The deck shall be supported horizontally with the center 60 in. (150 mm) from the front opening of the wind tunnel and the joists parallel to the airflow and resting on two transverse metal supports. The top surfaces of these supports, no more than 3 in. (75 mm) wide, are at the same height as the floor of the wind tunnel.*

*2. **Fragments**. Burning fragments shall be free to fall to the floor of the room.*

12-7A-5.8.3 Conduct of Tests

*1. **Number of tests**. Conduct the test on three replicate assemblies*

*2. **Procedure.** Adhere to ASTM E108 "Standard Test Methods for Fire Tests of Roof Coverings" (burning brand test, "A" brand), with apparatus modified as described above in "Test system preparation" and the following procedure:*

a. The air velocity shall be calibrated using the 60-in. (1.5-m) framework spacing, with the deck positioned 60 in. (1.5 m) from the front opening of the wind tunnel. All other measurement details shall be followed as specified in sections 4.4.2, 4.4.3, and 4.4.4 of ASTM E 108. Although ASTM E 108 specifies calibration to be conducted with the 33-in. (840-mm) framework spacing used for the intermittent flame test set up, tests have shown that at the nominal 12 mph setting, there was not difference in measured velocity between the 33- and 60-in. framework spacing.

(b) Ignite the "A" brands as specified in Section 9.4 of ASTM E 108, with the exception of the ignition sequence:

1. Each 12- x 12-in. (300- x 300-mm) face for 30 s
2. Each 2.25- x 12-in. (57- x 300-mm) edge for 30 s

(c) Center the burning brand laterally on the deck with the front edge 2.5 in. (64 mm) from the entering air edge of the deck.

(d) Continue the exposure for a 40-min period or until all combustion of the deck boards ceases or a board collapses.

(e) Heat Release Rate is not monitored because of the impracticability with the specified airflow.

*3. **Observations**. Note physical changes of the deck boards during the test, including deformation from the horizontal plane, location of flaming and glowing combustion, and loss of material (i.e., flaming drops of particles falling from the deck). It is desirable to capture the entire test with a video recorder to allow review of the details of performance.*

***12-7A-5.8.4 Report.** The report shall include description of the deck board material, and the time of any degradation (accelerated combustion, board collapse, flaming drops or particles falling from the deck.*

***12-7A-5.8.5 Conditions of Acceptance.** Should one of the three replicates fail to meet the Conditions of Acceptance, three additional tests may be run. All of the additional tests must meet the Conditions of Acceptance.*

1. Absence of sustained flaming or glowing combustion of any kind at the conclusion of the 40-min observation period.

2. Absence of structural failure of any deck board

3. Absence of falling particles that are still burning when reaching the burner or floor.

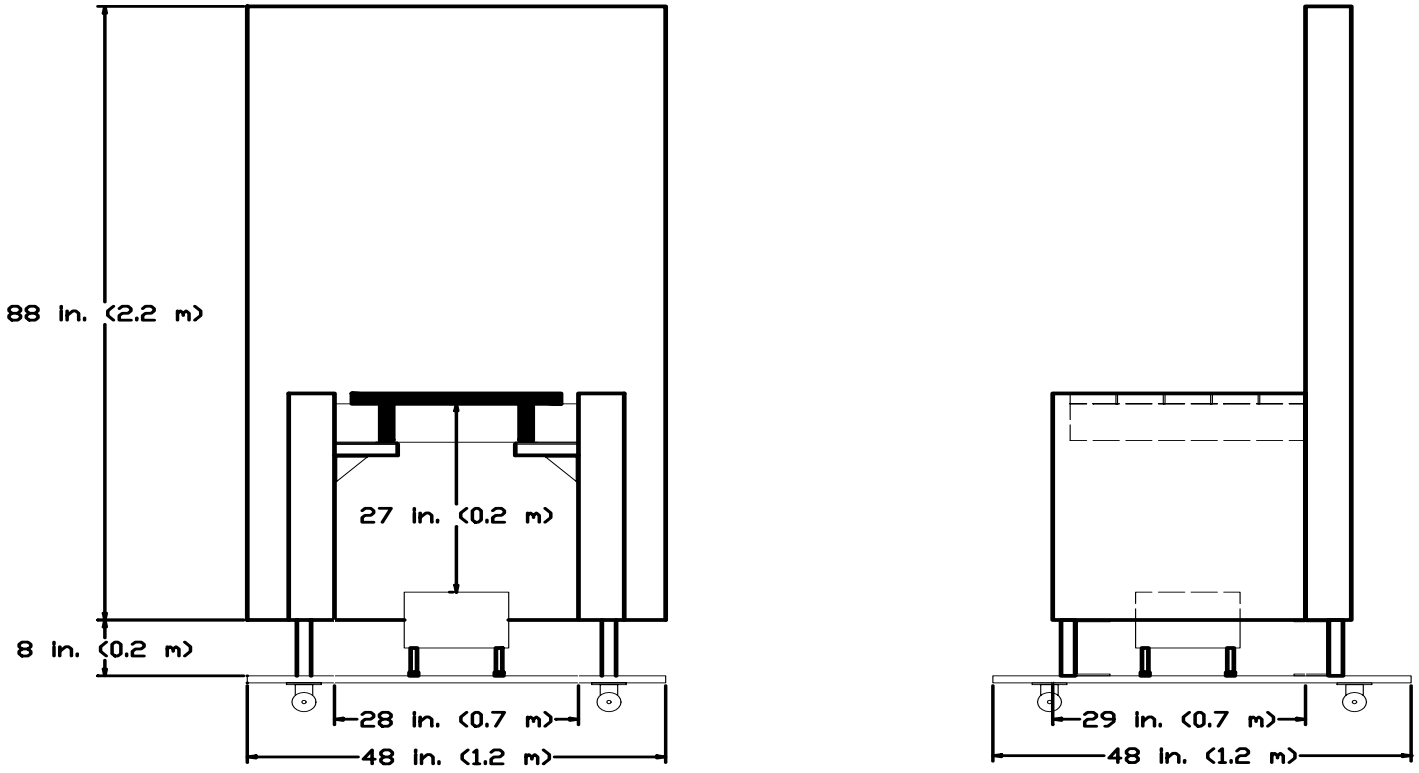

Figure 2. Deck Test Assembly (Under–flame)

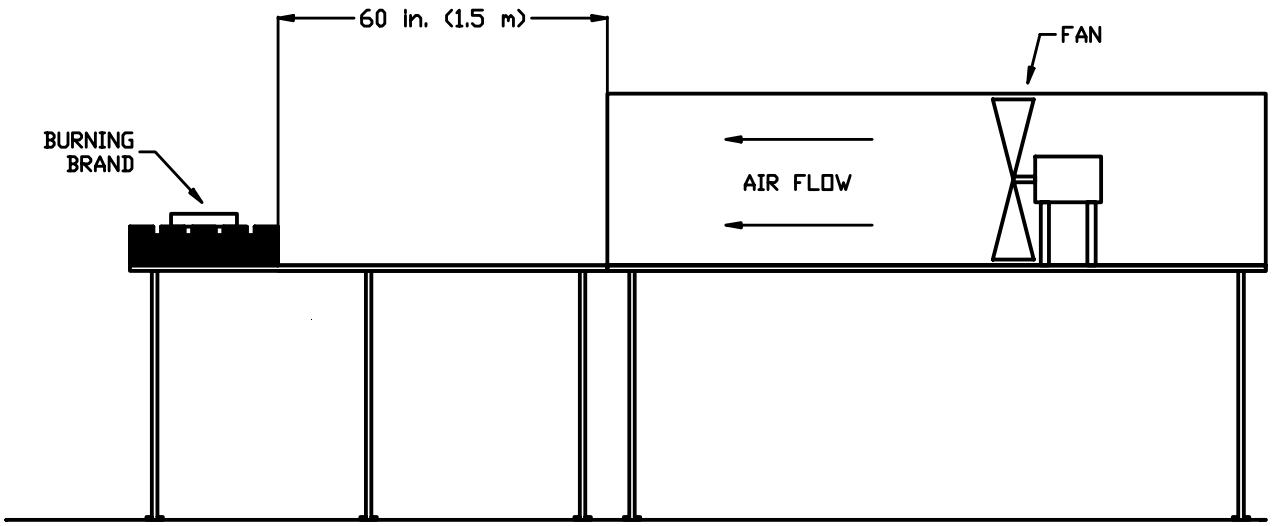

Figure 2. Deck Test Assembly (Burning-Brand)